REMARKS

Claims 1-6 were presented for examination. Claims 1-6 were rejected.

Claims 1-5 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. In response, these claims have been amended to cure any indefiniteness. Therefore, claims 1-5 should be in allowable form.

Claims 1-6 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In response, these claims have been amended to cure any indefiniteness. Therefore, claims 1-6 should be in allowable form.

Prior to discussion of novelty and inventive step in view of the cited document, Applicant would like to make the following comments. PP-waves are waves that are compression waves before reflection onto an interface separating two spaces with different impedances and remain compression waves after. PS-waves are waves that are compression waves before reflection onto an interface separating two spaces with different impedances and are converted to shear waves after. PP-waves and PS-waves both have horizontal components (with respect to the vertical corresponding to a normal direction to the water surface). More precisely, both have x components and y components.

Claims 1-4 and 6 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,205,403 to Gaiser. In response, in Gaiser, a method for determining the orientation of horizontal geophones is described, in which, first-break signals (comprising P-waves, P-wave refractions, P-wave and PS-wave reflections) [column 4, lines 6-9] are resolved into components along the line from the source to the geophones (x components) and a line perpendicular to that line (y components) by mathematical rotation of the signals through an angle [figure 6] creating two estimators, which are combination of x and y components.

$$\begin{pmatrix} S'_x \\ S'_y \end{pmatrix} = \begin{pmatrix} \cos(\theta) & \sin(\theta) \\ -\sin(\theta) & \cos(\theta) \end{pmatrix} \cdot \begin{pmatrix} S_x \\ S_y \end{pmatrix}$$

Then an energy value is computed as sum of square value of S'_y [column 4, lines 39-40].

$$E'_y = \Sigma S'^2_y = \Sigma [-S_x.\sin(\theta) + S_y.\cos(\theta)]^2$$

Then, the energy of the first-break signal along the *y* component for different value of the rotation angle is calculated and the least-squares problem is solved [equation 2].

$$\sum [E'_y(\theta_i) - (a + b.\sin(\theta_i) + c.\cos(\theta_i)]^2 = \min.$$

The coefficient a, b and c are then determined [column 4, lines 48-50].

The rotation angle is determined by least-squares problem [column 4, lines 34-37].

In Gaiser, although PP-waves (P-wave reflections) and PS-waves are mentioned [column 4, lines 7-10], data corresponding to one or the other are not sorted but are all projected into *x* and *y* components [equation 1].

Therefore, in Gaiser, the various data are not isolated depending on whether they correspond to propagation with reflection or with conversion as taught by claim 1(b). Also, should $-\sin(\Theta)$ and $\cos(\Theta)$ be considered as the operators, it is not perceived how the least-squares problem for determining the rotation angle is carried out. Therefore, it is not said that the operators are those that minimize a deviation between reference data and data obtained by applying the estimators to the sensors reconstruction as taught by claim 1(c). However, should a, b and c be considered as the operators, they are then not applied to the various components of the

sensor S'_x and S'_y as taught by claim 1(a). Therefore, claims 1-4 and 6 should be in allowable form.

Claims 1-6 were rejected under 35 U.S.C. § 102(a) as being anticipated by Great Britain Patent No. 2,379,505 to Horne. In response, in Horne, a method for "processing seismic data acquired at a receiver to obtain information about the orientation of the receiver and/or information about the vector infidelity of the receiver" [page 1, first paragraph]. The method uses a 3-component (3 geophones) receiver or a 4-component (3 geophones and a hydrophone) receiver [page 2]. It is said in the specification that a 4-omponent receiver makes it possible to separate the compression P-waves from the shear S-waves [page 2, last paragraph]. The method in Horne has the following steps.

First, data are collected in step 1. To each datum corresponds a travel time [pages 8 and 9]. Then, in step 2, minimum travel time amongst the data is determined. When considering the travel time surface, the minimum travel time is at a position where the spatial derivates are zero. This step determines the actual position of the receiver [pages 9 and 10]. In step 3, an offset (distance between the source and the receiver) value is determined for each source using the corrected receiver position as determined by the minimum travel time position [page 10].

$$\text{offset}_{\text{corr}} = ((x_i - x_0)^2 + (y_i - y_0)^2)^{1/2}$$

x_o and y_o are the coordinates of the receiver and x_i and y_i are the coordinates of the source used to generate the i^{th} shot. Then the travel time is plotted against the corrected offset. A fitted curve is obtained. Then using the fitted curve of step 3, a slowness vector is computed in step 4 and a polarization vector in step 5 [page 11]. The slowness vector $\boldsymbol{s}$ and the polarization vector $\boldsymbol{p}$ are in a relation according the following equation [page 12, first paragraph].

$$\boldsymbol{s} = \boldsymbol{M}\,\boldsymbol{p}$$

where $\boldsymbol{M}$ is a matrix.

In step 6, the matrix is resolved and in step 7, the matrix is polarly decomposed into a rotation matrix and a gain matrix [page 12, second to last paragraph]. Therefore, in the method of Horne, estimators that are combination of the geophone component are not determined as taught by claim 1(a); various data are not isolated depending on whether they correspond to propagation with reflection or with conversion (although it is said that the isolation is possible) as taught by claim 1(b); and operators, being those that minimize a deviation between reference data and data obtained by applying the estimators to the sensors reconstruction, that are to be applied to the various components of the sensor are not determined for determining a sensor reconstruction as taught by claim 1(c). Therefore, claims 1-6 should be in allowable form.

Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,205,403 to Gaiser as applied to claims 1-4 and 6 above, and further in view of PCT Publication No. WO0151955 to Baigini. In response, neither Baigini or Horne describes a method in which the data are isolated depending on whether they correspond to propagation with reflection or with conversion. On the contrary, both documents and Gaiser describe a method in which data are projected onto x and y components, without parting PP-waves from PS-waves, for processing seismic data. Therefore, any combination of Gaiser, Baigini or Horne cannot lead to the invention of Gratacos. Also, as all cited documents describe method in which wave signals (Gaiser and Baigini) or slowness and polarization vectors (Horne) are projected along x and y component, this shows that the solution propose by claim 1 or 6 is not obvious. Therefore, claim 5 should be in allowable form.

In commenting on the references and in order to facilitate a better understanding of the differences that are expressed in the claims, certain details of distinction between same and the present invention have been mentioned, even though such differences do not appear in all of the claims. It is not intended by mentioning any such unclaimed distinctions to create any implied limitations in the claims. Not all of the distinctions between the prior art and applicant's present invention have been made by applicant. For the foregoing reasons, applicant reserves the right to submit additional evidence showing the distinction between applicant's invention to be unobvious in view of the prior art.

The foregoing remarks are intended to assist the Office in examining the application and in the course of explanation may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not to be considered to be exhaustive of the facets of the invention which are rendered patentable, being only examples of certain advantageous features and differences which applicant's attorney chooses to mention at this time.

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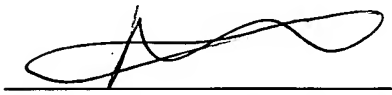
Reconsideration of the application as amended and allowance thereof is requested.

Please send all future correspondence regarding the above-referenced application to the undersigned at the address appearing below.

Respectfully submitted,



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